SUMMARY. To recapitulate (1) the prognosis in renal tuberculosis up to the present has been unfavorable under the present-day method of treatment. Nephrectomy as an operation for the relief of the patient suffering from tuberculosis in the kidney is a failure, for it fails to remove the focus of infection outside of the kidney, leaving the patient liable to extension of the infection to the remaining kidney from the same focus. The tuberculin treatment of renal tuberculosis has not been as satisfactory as the tuberculin treatment of other forms of tuberculosis, because of the inability to make an early diagnosis; (2) because of the production of early damage before the tuberculin treatment was instituted; (3) as a result of the failure to recognize the important rôle that mixed infection plays in the production of symptoms and pathological processes. However, enough has been shown with tuberculin treatment of renal tuberculosis, in fact, to make it almost certain that were it instituted before permanent damage has resulted—in other words, early in the disease—the prognosis of renal tuberculosis would have a far more favorable aspect. Early diagnosis in renal tuberculosis can be accomplished through the tuberculin test alone. Its more frequent use in early symptoms referable to an indefinite lesion anywhere in the urinary tract is absolutely essential to the more hopeful treatment of renal tuberculosis.

THE PULSE-PRESSURE TEST IN PREOPERATIVE ESTIMATION OF THE RESERVE STRENGTH OF THE CARDIO-VASCULAR SYSTEM.

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ALTHOUGH an enormous amount of work has been done with reference to the cardiovascular system and considerable progress has been made toward clearing up the problems associated with it, we are still without a test, simple and reliable enough for clinical use, for estimating the reserve strength of the heart, or rather the cardiovascular system. In many of the cases of so-called cardiac failure the trouble lies not with the heart itself but with the cardiovascular system and its controlling agents, and it is therefore necessary to consider the system as a whole in estimating its functional capacity. It is the efficiency of the whole system and its ability to compensate for the variable changes incident to the stress and strain to which it is subject that maintain the circulation sufficient for the needs of the organism. For the purpose of specific therapy it is necessary to determine which integral part of the system is at fault, but for estimating how much

strain the cardiovascular system will stand such differentiation is not essential.

It has probably been the experience of every surgeon to lose patients after operation from circulatory failure when this was least expected. The heart seems to be normal in the routine examination with the patient in bed, and the patient, from general appearances, seems to be a good surgical risk, and yet death follows from circulatory failure in from one to three weeks following operation. The following cases, in the service of Dr. Huggins, are examples of the types which stimulated our interest in this field, and a brief synopsis of the histories are given.

CASE I.—Mrs. T. M., aged thirty-eight years. No. 514. Admitted October 3, 1911. Diagnosis: Chronic appendicitis; myoma uteri; adhesions of ovaries.

Clinical Condition. Indigestion and pain in right side.

Family History. Negative.

Past History. Always enjoyed good health in childhood. Typhoid fever at thirteen. For last one and a half years has had frequent attacks of palpitation of heart. These come on sometimes without exertion. No shortness of breath on exertion.

Menstrual history negative except severe crampy pains at beginning of periods.

Married thirteen years. One child seven years old. Two miscarriages.

Present Illness. Dates from March, 1907. Patient had a severe pain in region of chest. Had difficulty in breathing. Physician was called and diagnosed trouble as pneumonia at first and later as "gall-bladder disease." Patient was not jaundiced following this, and there was no vomiting. Since then patient has been troubled with indigestion, and there is tenderness in upper right quadrant of abdomen.

Physical Examination. Heart: Sounds are clear. No murmurs. Heart not enlarged. Occasional "extrasystole" is heard on auscultation. Urine negative.

October 5, 1911. Operation by Dr. Huggins. Ether. Right rectus incision. Gall-bladder normal. A long thick-walled appendix bound down by adhesions in mid-portion was removed. Light adhesions about both ovaries were broken up. Uterus contained a fibroid the size of a normal uterus. This was not removed.

Patient made an uneventful recovery. Wound healed well and patient was allowed up on chair on fourteenth day after operation. The following note was made that night by the intern:

Patient seen about 10 P.M., having just been helped from couch to bed. Patient was lying on right side, with arms and legs partly flexed. Eyes partly open; staring, glassy expression; mouth open; respirations labored. Did not reply to questions. Pulse could not be felt at wrist. Carotid pulsation rapid, feeble, and

irregular. About two minutes after first seen patient shuddered and became conscious, and asked if she had fainted. Pulse could then be felt at the wrist, but was very weak and collapsible, varying greatly in force during short intervals. Patient complained of being very tired. Had no pain. Breathing at this time was slightly labored. Patient's face was of deathly gray color and covered with cold perspiration. Cardiac stimulants were given and there was some slowing of pulse and improvement in quality after intravenous injection of strophanthin, but condition remained precarious for twenty-four hours, when patient died.

It is interesting to note that the history, as far as was elicited by the intern, gave no symptoms referable to the cardiovascular system aside from palpitation of the heart, which the family physician attributed to her "gall-bladder disease." Physical examination of the heart showed nothing abnormal except an occasional "extrasystole." At that time we had no electrocardiograph and polygraphic tracings were not taken. The history and physical examination and appearance of the patient were not such as to make one suspect any serious cardiovascular trouble, and yet we feel sure that more careful study in this case would have revealed a narrow margin of safety.

CASE II.—Mrs. J. W., aged forty-six years. No. 1312. Admitted October 13, 1914. Diagnosis: Chronic cervicitis; laceration of perineum; cystocele; rectocele; prolapsus uteri.

Clinical Condition. Falling of womb.

Family History. Negative.

Past History. Usual childhood diseases. Typhoid fever at twelve. Troubled with cough and expectoration in the spring. Has had varicose veins for thirteen years. Has been troubled recently with a "nervous fluttering" in the head and stomach. Constipated for years and has hemorrhoids. Difficulty in emptying bladder. Menstrual history negative. Has had six children and one miscarriage. Puerperia normal. Last child eleven years ago. Instrumental delivery.

Present Illness. First noticed prolapse of uterus after last delivery eleven years ago. This has been worse in the last year. Had a flooding spell at menstrual period eight months ago. Has had two such spells since then, the last one four weeks ago.

Physical Examination. Patient is a large, stout, red-faced woman. Weight 215 pounds. Heart: Point of maximum impulse not seen or felt. Upper border of cardiac dulness begins at second interspace. Right border begins at midsternal line. Sounds at apex and base are clear. No murmurs made out. Pulse regular. Systolic blood-pressure, 110.

Vaginal Examination. Laceration of perineum with wide separation of transversus perinei and levator ani muscles and fascia. Rectocele and cystocele present. Stellate laceration of

cervix with enlargement and presence of considerable scar tissue and cystic degeneration. Profuse mucopurulent discharge. Cervix appears at vaginal orifice when patient strains. Body of uterus is somewhat larger and firmer in consistency than normal, and is retroverted. Adnexa normal.

October 16, 1914. Operation by Dr. Huggins. Spinal anesthesia. Vaginal hysterectomy. Perineorrhaphy. Drainage.

November 2, 1914. Aside from the postoperative pain, gas distention, and difficulty in voiding, patient apparently made a good recovery until the last few days, when it was noticed that patient was short of breath on talking and there was slight cyanosis of lips. Last night nurse heard patient turn over in bed and moan, and on examining her found the patient gasping, and death occurred a few minutes later.

In this case the apparently sudden demise might ordinarily be attributed to embolism, but we have the clear-cut history of very evident shortness of breath on talking, associated with slight cyanosis, for several days preceding death. The size of this patient made the ordinary methods of chest examination almost useless and emphasizes the need of additional measures.

The ability to estimate vital resistance is one of the most important factors in reducing mortality in modern elective surgery. This can probably never be done by instruments of precision, and will always be a matter of personal experience, observation, and judgment; but any test or method which aids those with less ability or confirms the judgment of those most skilled in this field is of great value in surgical work. In practically every operative procedure we subject the circulatory apparatus of the patient to a strain which varies with the extent of the operative procedure and the preoperative and postoperative management of the case. In patients with seriously handicapped circulatory apparatus the success or failure of the treatment depends on the surgeon's ability to judge the reserve strength of his patient and his ability to reduce to a minimum the strain of the whole procedure so as to conserve this strength. To draw on the reserve strength of the patient to such an extent that there is exhaustion to the stage when there is no comeback is fatal to the patient and a serious error of judgment on the part of the surgeon. To draw on the reserve supply more than is necessary is done at the expense of the patient's period of convalescence even though the patient recover.

Since circulatory failure still contributes to postoperative morbidity and mortality, how can we estimate the reserve strength of the cardiovascular system? The character of the pulse, the rate, the regularity or irregularity of rhythm and volume, the sphygmogram, the size of the heart, and the character of its sounds are aids to the surgeon who is weighing the preoperative, operative, and postoperative strain against the reserve strength of the circu-

latory apparatus. There is much of promise in the use of the electrocardiograph in this field, but comparatively few have access to its advantages. In examination of the circulatory apparatus, the tendency is too often to focus the attention on the physical examination of the heart. If the heart sounds are clear and there are no irregularities in rhythm, and the heart is not enlarged, we are prone to pass the circulatory system as normal. Our examination is too frequently anatomical and not functional. Incompetent valves, hypertrophied hearts, and irregular rhythms are only warning signals of possible cardiac insufficiencies. The most deceptive types of cases are those without these gross demonstrable lesions, cases in which there seems to be an exhaustion and loss of tone in the circulatory apparatus, with a small reserve strength. Huggins[1] calls attention to general loss of tissue tone in the whole organism, as is frequently seen in cases with prolapse of the uterus, as a warning signal of poor resistance on the part of the patient, and it is particularly in this class of cases that we find functional inefficiencies of the circulatory system without demonstrable gross anatomical lesions. The musculature of the cardiovascular system seems to share the weakness and lack of tone of the general musculature of the body.

Normally when an individual is subjected to work there is a compensatory response on the part of the cardiovascular system, as is shown by blood-pressure readings. Lowsley[2] found that in a normal individual after exercise there is a rise of blood-pressure as well as pulse-rate. There is a rise of both systolic and diastolic pressures, but there is less rise in diastolic than systolic, so that there is also an increase in pulse-pressure. He obtained the following results after exercise on a stationary bicycle:

Average rise in systolic	pressure	in	16	cases	32.7 mm.
" " diastolic	"		17	"	22.9 mm.
" " pulse	"		17	"	18.3 mm.
" " pulse rate			11	"	51 per min.

He also found that as fatigue advances the systolic pressure falls.

Middleton[3] found an average systolic rise of 24 mm. and diastolic rise of 12 mm. of mercury after fifty running steps in normal individuals.

Barringer[4] found that normally there is a rise in systolic pressure following exercise, but as exhaustion comes on there is a delayed rise of pressure. He found this delayed rise also present in cases of cardiac insufficiency. In some of his cases of cardiac insufficiency he observed that the blood-pressure reactions to work became

[1] Tr. Am. Gyn. Soc., 1916.
[2] Am. Jour. Phys., 1911, xxvii, 446.
[3] Am. Journ. Med. Sc., September, 1915, p. 426.
[4] Arch. Int. Med., March 15, 1916, p. 363.

less and less marked as work progressed until a stage was reached in which the systolic pressure immediately after work was lower than before the work was begun.

Barringer and Teselmer,[5] in a previous article, state that sometimes the systolic pressure after work was found to be lower than beforehand, and that this is to be considered as an extreme type of delayed reaction, and means that the heart has been decidedly overtaxed by the preceding work. Grampner[6] states that if blood-pressure after work is lower than normal and then slowly returns to normal, but does not rise above normal, a primary myocardial weakness exists and this reaction is characteristic of pathological insufficiency. The significance therefore of a fall in systolic pressure immediately after work has been recognized and emphasized.

Warfield[7] states that in a failing heart the maximum pressure approaches the minimum pressure until the pulse-pressure is *nil* and circulation ceases, and emphasizes the significance of a rising diastolic pressure. It was this article that suggested to us the use of pulse-pressure readings as a means of estimating the ability of the circulatory system to withstand strain, for it is the additional strain of the surgical ordeal that is responsible for the circulatory exhaustion or collapse in the cases cited above. Our plan was to subject the patient to the strain of work and observe not only the systolic pressures but the diastolic and pulse-pressures as well, for the pulse-pressure is the head of pressure which is actually driving the blood through the circulatory system, and inasmuch as the cardiovascular system maintains pulse-pressure when an additional strain is imposed on it, so much is efficient circulation maintained. During the course of our work a brief paper by Lankford[8] appeared in which he describes practically the same test, suggested to him by Jackson, of Rochester, which he has been using satisfactorily in life insurance examinations.

Our method of testing patients is to subject them to moderate exercise, such as the use of dumb-bells or walking rapidly for prescribed distances, depending on the nature of the case and noting the effect on the pulse-rate and the systolic, diastolic, and pulse-pressures. The auscultatory method is used for blood-pressure and the transition from the third to fourth phase is considered as diastolic pressure. The pulse-rate for one-half minute and the systolic and diastolic pressures are taken with the patient in the recumbent position. This is repeated with the patient in the standing position, and then after the exercise, and again with the patient in the recumbent position. Normally in changing from the recumbent to the upright position there is a compensatory

[5] Arch. Int. Med., November 15, 1915, 795.
[6] Deutsch. med. Wchnschr., 1906, No. 26
[7] New York Med. Jour., September 4, 1915, 508.
[8] Southern Med. Jour., March, 1916, p. 193.

response on the part of the vasomotors, so that the hydrostatic effects of gravity are overcome and circulation is maintained.

Sewall[9] emphasizes the fact that in patients with poor vasomotor tone, as is so often seen in debilitated conditions or in cases with splanchnoptosis, there is a fall in systolic pressure in changing from the recumbent to the upright position. We have found this to be true, and we find that it is necessary to take readings in the upright position previous to the exercise in order to note the true effects of the exercise on the pulse-rate and blood-pressure. By taking readings in the recumbent position also we are able to estimate the vasomotor tone of the patient. The following is an example of marked symptoms in such a case, and the chart readily explains the cause of the patient's symptoms. In this case, however, it is the fall in pulse-pressure due to rise in diastolic pressure rather than a fall in systolic pressure that produces the symptoms. There is a marked splanchnoptosis and there is retention of bismuth contents in the stomach after six hours.

CASE I.—Mrs. M. B., aged thirty-three years. Patient is confined to bed constantly because of dizziness, faintness, and exhaustion, with dyspnea, sighing respirations, and yawning when in the upright position. Patient has the same symptoms after eating or at defecation. Some relief on application of abdominal binder. Feels better when walking than when standing. Roentgen ray of bismuth meal shows large prolapsed stomach with lower border in the pelvis.

PULSE-PRESSURE TEST.

	Pulse-rate per minute.	Systolic pressure.	Diastolic pressure.	Pulse pressure.
Reclining	84	95	70	25
Standing	156	110	100	10
After exercise	160	112	95	17
Reclining	96	110	95	15

Note the marked increase in pulse-rate and the fall in pulse-pressure due to rise in diastolic pressure when patient is in the upright position. This was associated with a feeling of faintness and palpitation.

In the use of dumb-bells all readings are taken in the recumbent or in the upright position. Normally after moderate exercise there will be a rise or at least there should not be a fall in systolic pressure. There should also be an increase in pulse-pressure.

A fall in pulse-pressure, whether due to a fall in systolic pressure or a rise in diastolic pressure, or both, is considered as evidence of poor response to mild strain on the part of the circulatory apparatus. This is usually associated with an undue increase in pulse-rate, and is usually accompanied by breathlessness, dizziness, or fatigue. A marked fall of pulse-pressure is considered as a grave sign. It is in these cases of poor response to exercise that we are

[9] AM. JOUR. MED. SC., April, 1916, p. 491.

especially cautious as to the amount of operative strain we are willing to submit the patient, and frequently to the extent of refusing operative procedures. The following cases illustrates poor response to exercise:

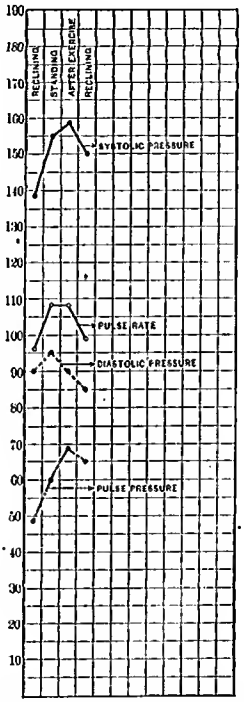

CHART 1.—Normal response to exercise. Case 2, Mrs. D., aged sixty years. Two days after above test a large cyst containing 9 liters of fluid was removed from lesser peritoneal cavity by Dr. Huggins. Spinal anesthesia; good recovery.

CASE III.—Mrs. S., aged forty years. Diagnosis: Prolapse of uterus; duration ten years. Worse in last six months. Attacks of vertigo and occipital headaches, shortness of breath on exertion, and palpitation at times.

FIRST TEST ON DAY AFTER ADMISSION.

	Systolic pressure.	Diastolic pressure.	Pulse pressure.
Reclining	118	80	38
After exercise	120	112	8

SECOND TEST AFTER TEN DAYS' REST IN HOSPITAL.

	Pulse rate per minute.	Systolic pressure.	Diastolic pressure.	Pulse pressure.
Reclining	88	108	72	36
Standing	106	116	94	22
After exercise	106	106	91	12

Note fall in pulse-pressure, chiefly due to rise in diastolic pressure. Patient was refused operation at this time.

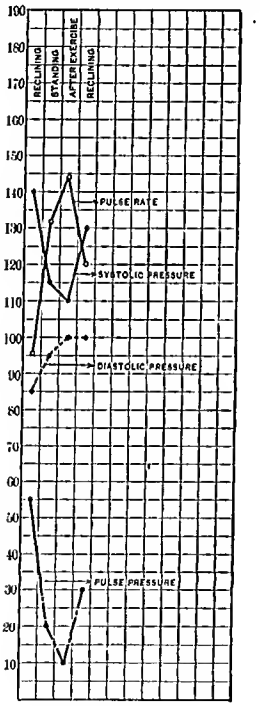

CHART II

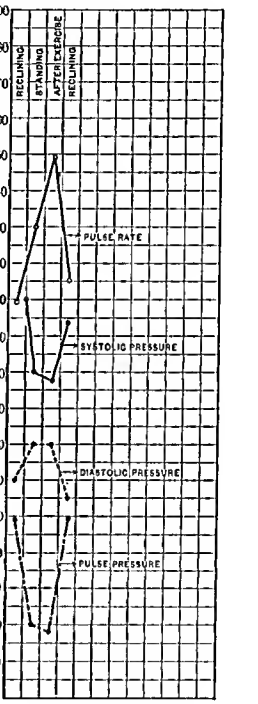

CHART III

CHART II.—Very poor response to exercise. Case 4, Mrs. S., aged forty-eight years. Diagnosis: carcinoma of cervix. Operation: amputation of cervix, with cautery, under low spinal anesthesia. Above test was made five weeks after this operation. Patient had attacks of dyspnea at night, and at no time was it deemed advisable to undertake further operative procedures.

CHART III.—Very poor response to exercise. Case 5, Mrs. B., aged fifty-six years. Diagnosis: lacerated perineum. First degree prolapse of uterus. Chronic endocervicitis. Patient was kept in bed for two weeks, with very little improvement in general condition. Following operation was done under local infiltration anesthesia by Dr. Huggins: D. and C. Amputation of cervix; perineorrhaphy; good recovery.

CASE VI.—Mrs. L., aged fifty-two years. Diagnosis: Lacerated cervix, chronic cystitis, and pyelitis. Chronic appendicitis, omental adhesions.

PULSE-PRESSURE TEST.

	Pulse-rate per minute.	Systolic pressure.	Diastolic pressure.	Pulse pressure.
Reclining	82	120	75	45
Standing	96	95	70	20
After exercise	104	95	70	25
Reclining	80	130	75	55
Reclining (ten minutes later)	..	125	70	55
After use of dumb-bells	..	108	85	23

Two weeks later the following operation was done by Dr. Huggins under spinal anesthesia: Trachelorrhaphy, appendectomy, separation of omental adhesions.

Patient suffered from distention for several days after operation. Recovery otherwise uneventful.

CASE VII.—Mrs. S., aged forty-one years. Diagnosis: Bilateral chronic salpingitis with adhesions. Patient has attacks of dizziness and dyspnea on slight exertion. No swelling of feet and ankles. Heart normal in size. Point of maximum impulse in normal position. Heart sounds clear. Rate is increased above normal. Acrocyanosis present. Urine shows trace of albumin.

PULSE-PRESSURE TEST.

	Pulse-rate per minute.	Systolic pressure.	Diastolic pressure.	Pulse pressure.
Reclining	90	95	75	20
Standing	120	85	72	13
After exercise	141	?	?	?
Reclining	108	80	65	15

After exercise the pulse was rapid and scarcely palpable at wrist. Heart sounds were weak but no murmurs heard. Patient complained of feeling weak and faint. Face had distressed appearance. Sounds were not heard at elbow and blood-pressure readings could not be determined. Patient was refused operation.

It will be noted that in Cases III and VII the patients were refused operation. In Case IV (Chart II) an incomplete operation was performed under low spinal anesthesia. This judgment was confirmed by the after-history of this patient. Three months after she went home she was still confined to bed because of weakness and "smothering spells." In the other cases operation was done under local or spinal anesthesia in order to throw the least possible strain on the circulatory system. All of these patients gave a history of tiring easily, or slight dyspnea, or slight swelling of the feet, or dizziness or spots before the eyes, or palpitation at times. These are often not sufficient to attract the attention of the intern in taking the history, and in the routine physical

examination the heart is usually passed as normal. These patients are often well nourished and of a florid complexion, so that at first sight they appear to be good surgical risks. The increased rate and the quality of the pulse are the most important signs in attracting our attention.

The following case is of interest because the patient was sent into the hospital by her physician for observation, with diagnosis of "hysteric." Patient is a stout, red-faced woman, weighing 190 pounds. She complains of weakness and "weak spells." Four weeks ago she had a weak spell, with shortness of breath, and patient fainted. Routine examination of heart and lungs negative, except weak heart-sounds. Hemoglobin, 100 per cent. Wassermann test negative. Urine contains a trace of albumin, otherwise negative. Pulse regular but weak.

CASE VIII.—Mrs. S., aged thirty-one years.

PULSE-PRESSURE TEST.

	Pulse-rate per minute.	Systolic pressure.	Diastolic pressure.	Pulse pressure.
Reclining	54	90	55	35
Standing	112	85	70	15
After exercise	120	?	?	?
Reclining	54	95	65	30

After exercise the patient complained of exhaustion. The pulse was scarcely palpable at wrist and the sounds were not heard at the elbow. With patient in the upright position before the exercise the sounds at the elbow were faint on listening with the stethoscope.

In our blood-pressure observations under spinal anesthesia, difficulty has frequently been experienced in determining the diastolic pressure because of the marked lowering of pressure in this type of anesthesia, so that at present we are using a blood-pressure bracelet stethoscope for all blood-pressure observations, and this will probably eliminate the difficulties experienced in the above two cases (Cases VII and VIII) in determining the pressures after exercise.

The next case illustrates what happened after operation in a case showing poor response to the pulse-pressure test:

CASE IX.—Mrs. P. McH., aged thirty years. Admitted December 17, 1916.

Clinical Condition. Pain in abdomen.

Family History. Negative.

Past History. Rheumatism when she was young (in bed two weeks). Frequent sore throats when young. No dyspnea. No palpitation. Menstrual history negative. Married two years. No pregnancies.

Present Illness. Began one month ago with soreness in both iliac regions. Soreness gradually became worse until twelve days

ago, when she had severe sharp stabbing pains in both iliac regions. Pains intermittent. More severe at night than in day. Pain was worse on left side at first, but the last few days has been worse on right side. Marked increase in leucorrhea since onset of point impulse.

Physical Examination. Vaginal examination shows pelvis filled with a fixed, hard, tender mass. Uterus fixed. Mass is larger on left side. Mass apparently includes uterus and adnexa and consists of inflammatory exudate. No softening nor fluctuation made out. Temperature 100° F. White blood cells, 18,000. Patient was kept in bed for eleven days, during which time she complained of pounding of heart at times. Rate was accelerated. Temperature became normal and all pain in pelvis disappeared. Heart normal in size. Sounds clear. First sound weak and tendency to embryocardia present. Rate 108 per minute. The pulse-pressure test was then made, with the following results:

PULSE-PRESSURE TEST, CASE NO. 9.

	Pulse-rate per minute.	Systolic pressure.	Diastolic pressure.	Pulse pressure.
Reclining	108	95	60	35
Standing	132	90	75	15
After exercise	141	88	75	13
Reclining	108	90	65	25

Patient had recurrence of pain in pelvis for a day or so after this exercise, which again subsided. Three weeks after admission patient was operated on by Dr. Huggins. Ether anesthesia. A large tuboövarian abscess was found on left side and right adnexa densely adherent. Uterus and adnexa were roofed over by adherent bladder and sigmoid. Both tubes, the left ovary, and appendix were removed and drainage established. Patient ran a very rapid pulse throughout the operation, and pulse was weak when patient left the table. During the first twenty-four hours the pulse was very rapid and weak, at times being scarcely perceptible at wrist and running between 150 and 200, as far as could be determined, after which it remained around 120 for six days and at the present time is 110. This is the only case in which we have done an extensive operation with ether in a patient who responded so poorly to exercise since we began using this test, and we were considerably alarmed as to her condition after operation and feel that in this case the result confirmed the value of the test.

Because of the difficulties in accurately determining the blood-pressures in cases with gross irregularities in the force of the heart-beat this test is limited in value, but it is not in this type of case that we need such a test, for our usual methods of examination suffice to give us ample warning of the condition. Its chief value is in the cases in which the force and rhythm are regular or but

slightly irregular, the type of case in which our ordinary method of examination does not throw light on the condition of the circulatory apparatus, and the type of case in which surgeons are so liable to blunder. We feel that this test signifies the ability of the cardiovascular system to respond to strain at the time the test is made and that it does not signify what portion of the cardiovascular system is at fault. The condition may be due to a permanently damaged heart muscle or cardiovascular system, which is working with very little reserve and which may fail if subjected to sudden strain. On the other hand the condition may be a temporary one, due to toxemia, exhaustion, or fatigue, but nevertheless this is the type of case that should not be subjected to additional severe strain. How frequently we find women who are worn out from multiple pregnancies, toxemias, and chronic infections suffering from chronic fatigue and exhaustion. If the histories of these patients are gone into carefully we find that they tire readily, suffer from dizziness, dyspnea on exertion, weak spells, or slight swelling of the feet and ankles, although the heart appears to be normal by the ordinary methods of examination. These are the patients who have stormy convalescence after abdominal section.

Increased pulse-rate and flabby tissues usually attract our attention on physical examination. Low blood-pressure, varicose veins, and acrocyanosis are often indicative of subnormal tissue tone. The association of this condition with prolapse of the uterus, gall-bladder disease, and fibroids is sufficient to attract attention. We have found that many of these patients improve and become fairly good surgical risks after a prolonged rest in bed, and their condition is due to fatigue, apparently, or at least this makes up a goodly portion of the handicap regardless of the secondary causes. In certain cases the damage is apparently permanent and the improvement under rest is slight. The following case illustrates the improvement that may follow a prolonged rest:

One of the surprising results of this work to us is the frequency of this condition, when one is on the lookout for it, in stout women of middle age, the type that are afflicted with gall-bladder disease, prolapse of the uterus, and fibroids, and we are convinced that many of the deaths that occur one, two, and three weeks after operation in this type of patient and are attributed to embolism and various causes are in reality due to circulatory complications, many of which could be avoided by more careful preoperative study of the patients. The cases and charts cited above are only striking examples of types which we see in varying degrees.

If the preoperative apprehension, the expenditure of energy due to rapid forced breathing, rapid pulse-rate, struggling and loss of heat and fluid as a result of the ether drive, the operative trauma and hemorrhage, and the postoperative pain and discomforts be compared to the strain of a cross-country run we have analogous

conditions. If subjected to a long cross-country run these handicapped patients would fall from exhaustion or die. Unfortunately, under anesthesia, we can carry these patients, unable to make a

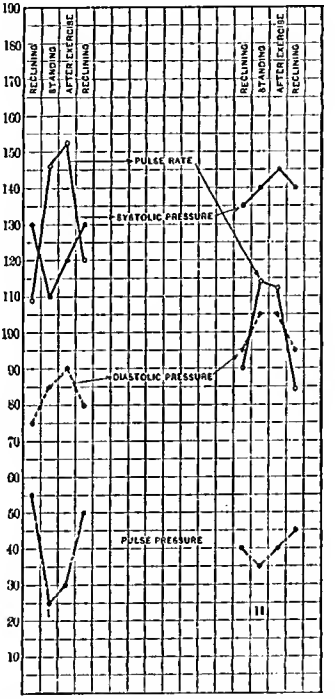

CHART IV.—Case No. 10. Mrs. M., aged forty-five years. Diagnosis: postoperative intestinal adhesions; chronic morphinism. *I*, test on first admission to hospital; *II*, test three months later, after a prolonged rest, during which patient improved in general condition. Note the improvement in pulse rate and pulse pressure curves.

protest, so far beyond the exhaustion stage that there is no comeback.

Patients with little reserve and who respond so poorly to light strain should be subjected to neither a severe operation nor a cross-country run as an elective procedure.